• Exhibit 1 •

Comments: ET Docket 93-62

January 21, 1994

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
SAN FRANCISCO

BOARD OF STANDARDS REVIEW

LETTER AND EXHIBITS IN SUPPORT OF APPEAL AGAINST ADOPTION OF IEEE C95.1-1991 AS AN AMERICAN NATIONAL STANDARD

February 4, 1993

Hammett & Edison, Inc.
Consulting Engineers
San Francisco

Remarks of Appellant William F. Hammett February 4, 1993

My name is William F. Hammett; I am a Professional Engineer and the president of Hammett & Edison, Inc., which for 41 years has provided consulting engineering services to radio and television stations across the United States. Thank you for considering our appeal and for the opportunity to address this Board. The history of our involvement with this issue is a matter of record, much of it before you as I speak, and I will not take the Board's time to review every technical argument, every letter, and every response (or lack thereof).

Public speaking is reputed to be the #2 fear of Americans, right after death by drowning. So it would not be surprising if my feet were a little sweaty right now. That fact will affect any measurements I might make of radiofrequency current through my body, under the terms of the proposed C95.1 standard. Then when I go outside on this blustery New York day, my feet will dry out, and the measurements would now give a different answer.

What we are here to review is whether this Board, charged with approving standards for an enormous range of products that affect the welfare and safety of all Americans, will accept today as its own this C95.1 standard that IEEE has adopted. I think it's faulty, for the reason I just illustrated as well as several others. In addition, the record shows that IEEE has adopted this standard with disregard for the negative impact on the owners and operators of the *only* class of intentional emitters of radiofrequency energy: FCC licensees. Broadcasters are licensed by the Federal Communications Commission to use the unique RF spectrum in the public interest. Their duty, which they take seriously, is to serve the public through dissemination of news, entertainment, and public service announcements, and broadcasters also must participate in the nationwide Emergency Broadcast System, which may be used in the event of natural disasters and national crises.

It is my firm that has carried the burden of this appeal and, therefore, I am making the opening and concluding remarks. But by no means are we alone. I think it important for you to recognize the depth of discontent within the broadcast industry. Only three persons may speak today, in accordance with your hearing rules, but I hope you will refer at your convenience to the many letters included as Exhibit 18 in the packages I have delivered to you. There you will find a number of separate opinions, all of them opposed to the adoption by ANSI of the IEEE standard as drafted.

I would like to have you hear very early in our presentation from two representatives of the broadcast industry, both of whom have volunteered to speak to you today in support of our appeal. As you listen to their remarks, consider the two questions of most importance today, questions you will have to answer when you decide whether to sustain or deny our appeal.
These two questions are:

1) Is there a consensus among the members of the affected industry? and

2) Has the developer of the standard done everything it was supposed to do?

The first representative is Mr. Kelly Williams, of the National Association of Broadcasters.

The second representative is Mr. Michael Chiarulli, of ABC/Cap Cities.

Remember the two questions: Is there a consensus within the industry? I think it is clear that, no, there is not consensus agreement with the drafted standard. In fact, though, one could conclude that there is consensus, that is, consensus within the broadcast industry that the IEEE standard as drafted is *bad*, that it would have *negative, unjustified ramifications* on that industry, and that it should *not* be adopted by ANSI as it is. As to the second question, did IEEE follow the proper procedures, I think it should be answered, clearly, no.

I must stress that we find the bulk of the IEEE standard to be sound and entirely appropriate as a revision of ANSI C95.1-1982. There is, however, that new section on body currents, a section that is inappropriately drafted. Not only does it go "where no one has gone before," it is ill-defined and will lead to application of the standard in a manner that is not consistent, not repeatable, and not justified, hardly hallmarks of a good standard. An ANSI standard should be precise, it should be applicable evenly to the classes of affected products, and it should have a solid basis for burdening the impacted industry. I realize that the goal here today is not to argue the merits of the widespread and repeated objections to that section as drafted. Our goal is to establish the existence of those timely objections and to establish the breadth within the industry of those objections. I trust that we are achieving that goal.

I am not an attorney, but as someone directly involved in interpreting the ANSI C95.1 standard as it applies to client radio and television stations, I am concerned about liability. If you approve a standard that does not define the conditions under which it applies, you open up all parties affected by the standard to the risk of litigation. In this case, does one measure the body current for a 72-inch male, a 63-inch female, or a 36-inch child? Does one measure with rubber soles, leather soles, or bare feet? *Are one's feet sweaty or dry?* All of these factors are admitted by IEEE to make an enormous difference in the measurement of body current. The IEEE argues in one of its letters for a loose interpretation of the standard, but we who must live with the standard do not have such freedom. We cannot apply varying interpretations; we have to follow the letter of the standard. But here there is no "letter" to follow, so we have to determine what is the most conservative interpretation. ANSI should not force us to guess; we want a standard whose requirements are precise and will be agreed upon by everyone who reads it.

It is not our interest to lay blame in any quarter, despite the fact that the record clearly shows we have been treated with disdain from the outset, from the refusal of IEEE to send or even *sell* us a copy of the draft standard, to the exclusion from meeting minutes of the appearance by our firm, and to the lack of response, still, to our request to become a member of the IEEE SC-4. The latest letter from the IEEE includes the snide remark that "the ANSI/IEEE C95.1 standard is not a broadcast standard, but a public safety standard that applies only to the human race". No one has suggested that the standard be tailored for the exclusive benefit of one narrow interest; this is *not* special-interest lobbying. The standard is, though, for "safety levels with respect to human exposure to *radio frequency* electromagnetic fields" – who does the IEEE think produces the most radiofrequency electromagnetic fields, but radio and television broadcast stations? To promulgate a standard without regard to its implications on the impacted industry is irresponsible, at best. To do so on the basis of limited data and in the face of unaddressed objections is reprehensible, at worst.

It is also important to note that our objections have been consistently mischaracterized by the IEEE as an attack on the inclusion *at all* of the new section on conducted body current. This is not true now, and never has been true; we do not object to the inclusion of such limits. Yes, some of our letters have expressed the opinion that the body current section was so ambiguously written and so arbitrarily defined that the standard would be better without it. But what we object to most is the extension of body current limits beyond their appropriate range. *One* study has been done up to frequencies that high, one study which just happens to have been done by the Co-Chair of IEEE SC-4, and that study itself shows the limit need not go that high. The new Canadian standard does not go that high, no other standard goes that high, and it would be a mistake for ANSI to go that high.

The solution here is very simple – remand the proposed standard back to IEEE with instructions to consider, at last, three essential changes: 1) limit the conducted current guideline to 40 MHz, 2) delete the "two feet" contradictory language, and 3) define the size and impedance of the human model required to be used as part of the measuring apparatus.

- If this Board does any less, you will be accepting a flawed standard, one based on *improper procedures* and *bad science.*
- Do not tarnish the ANSI name by adopting *as it is* the work IEEE has given you.
- **Sustain our appeal.**

Thank you for your attention. I and the representatives of the affected industry would be happy to entertain any questions you might have for us, now or at any other time in this hearing.

HAMMETT & EDISON, INC.
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February 4, 1993

Ms. Beth Somerville, Secretary
Board of Standards Review
American National Standards Institute
11 West 42nd Street
New York, NY 10036

Re: Appeal of Board of Standards Review Action to Approve ANSI/IEEE C95.1-1992 as an American National Standard

Dear Ms. Somerville:

Hammett & Edison, Inc., Consulting Engineers, hereby submits the following in support of its appeal against adoption of Institute of Electrical and Electronics Engineers (IEEE) C95.1-1991, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", as an American National Standard.

Hammett & Edison recognizes the efforts of the IEEE Standards Coordinating Committee 28 (SCC28) in its attempt to develop a successor standard to ANSI C95.1-1982. Indeed, evidence of the difficulty of that undertaking is provided by the "1992" designator assigned to the proposed successor standard, which is 5 years past the 5-year review cycle that is supposed to apply to American National Standards. However, IEEE is incorrect in characterizing our objection as a "late complaint", on two grounds: first, our initial complaint was filed in 1990, over three years ago, when IEEE C95.1-1991 was still in its draft form. Second, even if no prior objection had been raised, an objection filed by February 25, 1992, is timely filed according to the December 27, 1991, *ANSI Standards Action* newsletter asking for just such input. If IEEE does not want public participation or scrutiny of a standard it has developed, then it should not attempt to have the standard be called an "ANSI" standard.

We first learned in 1990 that the new IEEE standard proposed to adopt a conducted current limit. Our concern was not with the concept of a conducted current limit *per se*, but rather with the proposed extension into the VHF television and FM broadcast bands. We felt that terminating the conducted current specification at 100 MHz, in the middle of the FM broadcast band, was particularly inappropriate.

LACK OF DUE PROCESS

As documented by the attached exhibits, we were eventually able to obtain what was then a draft version of the proposed successor standard, although the IEEE did not make this easy (EXHIBITS 1-3). We then wrote IEEE, expressing our concerns (EXHIBIT 4). As further documented by the attached Exhibits, it was over two years later, in November 1992, that we learned from the Co-Chair of the SC-4 Subcommittee that our then timely letter had never been forwarded to him, for distribution to all SC-4 members! While SC-4 members Cohen and Tell were aware of this letter, because we had sent courtesy copies

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directly to them, this is not the same as forwarding the letter to the two Co-Chairs of SC-4, and to the other SC-4 members, to allow the subcommittee as a whole to consider the issue and be aware that a controversy existed.

We have also learned that a second objection to IEEE C95.1-1991, filed by C.S.I. Telecommunications ("CSI"), was similarly ignored by IEEE. We additionally learned that IEEE C95.1-1991 was voted upon by ANSI while there were unresolved objections still pending (ours, and CSI's). This appears to be a direct violation of Section B5, "Disposition of Views and Objections", to the ANSI *Operating Procedures of the Board of Standards Review* (December 6, 1990). Section BSR6.3 requires that each objector be advised in writing of the disposition of their objection and the reasons therefore. We have never been advised of the disposition of our August 31, 1992, letter (EXHIBIT 5) re-affirming our objection to IEEE C95.1-1991, and CSI has never had any response to its objection (EXHIBIT 9B) to IEEE C95.1-1991. The failure to respond to the CSI objection is a violation of BSR Section 6.3, which requires a written response to an objection, and also a violation of BSR Section 7.5(2), which requires notification of approval to those on record at ANSI who have objected to approval by ANSI.

Although SCC28 claims that the process resulting in the current IEEE standard has been an open forum, such is not the case. SCC28 has made it as difficult as possible for "outsiders" to learn details of, or to participate in, the development of IEEE C95.1-1991. As evidence, we submit the following exhibits:

Exhibit 1: May 3, 1990, letter to IEEE, requesting information on the C95.1 draft standard.

We first learned of the C95.1 draft in May of 1990, as a result of an article that appeared in the 1990 *International Journal of EMC*. Since any revision to ANSI C95.1-1982 would be likely to have a significant impact on our work of designing broadcast facilities and determining whether broadcast facilities comply with the ANSI radio frequency radiation (RFR) standard, we desired to learn details of the draft standard. We accordingly wrote ANSI, requesting a copy of the draft standard.

Exhibit 2: July 30, 1990, form letter response from IEEE declining to provide a copy of the draft standard.

As documented by the attached form letter response, dated July 30, 1990, almost *three months* later, IEEE declined to provide a copy of the draft standard.

Exhibit 3: August 3, 1990, letter to IEEE, questioning propriety of refusal to provide copy of draft standard to interested parties.

Exhibit 3 documents that IEEE provided a copy of the C95.1 draft only after being sent a certified mail, return receipt requested letter, questioning the propriety of refusing to release a copy of the draft to an interested and impacted party. This letter resulted in our receiving a copy of the draft standard, on August 23, 1990.

Exhibit 4: September 5, 1990, letter to IEEE, pointing out problems with extending contact/induced current limits to 100 MHz.

Our September 5, 1990, letter expressed our serious concern regarding the proposed extension of induced current limits to 100 MHz, and the fact that body currents are dependent on the size, orientation, and clothing being worn by a human in a given radio frequency field. We specifically requested that our letter be circulated among the appropriate IEEE SCC28 committee members. We also independently sent courtesy copies of our letter to SCC28 members Jules Cohen, Richard Tell, and Ralph Justus.

Exhibit 5: November 1, 1991, and January 6, 1992, letters to IEEE, requesting copy of final version of IEEE C95.1.

Realizing that the ninth revision, "final-final" draft of IEEE C95.1 might have been changed as a result of our September 1990 letter, our November 1, 1991, letter (EXHIBIT 5A) requested a copy of the final version of IEEE C95.1. In response we received a second copy of the final-final draft of IEEE C95.1. Our January 6, 1992, letter (EXHIBIT 5B) returned that duplicate copy and again requested the non-draft version of IEEE 95.1. *We have yet to receive a copy of the final, non-draft version of IEEE C95.1-1991.*

Exhibit 6: February 20, 1992 letter formally objecting to proposed adoption of IEEE C95.1-1991 as an American National Standard.

Our February 20, 1992, letter was submitted in response to the December 27, 1991, ANSI *Standards Action* newsletter, *requesting comments from interested parties.* Having *never received a response* to our September 5, 1990, letter, we felt compelled to respond to the ANSI *Standards Action* newsletter request for comments. This objection was sent to the Board of Standards Review (BSR) by Federal Express on February 20, for delivery on February 21, 1992. The Hammett & Edison objection therefore met the February 25, 1992, deadline for commenting on the proposed action. Our objection was again to extending conducted body currents to the VHF range, and in particular the arbitrary 100 MHz cutoff point.

Exhibit 7: March 18, 1992 letter from Dr. Om P. Gandhi

Exhibit 7 is a response letter written by Dr. Om P. Gandhi, SCC28 Subcommittee 4 (SC-4, "Safety Levels with Respect to Human Exposure, 3 kHz-300 GHz") Co-Chair. That letter pointed out that it had been demonstrated that excessive body currents could be induced in the 3 to 40 MHz band. Apparently Dr. Gandhi did not understand that our objection was to extending the conducted body current standard to VHF low-band television stations (54-88 MHz) and to approximately half of the FM broadcast band (88-108 MHz). Dr. Gandhi's letter additionally provided restrictions *not appearing in the IEEE Standard,* namely that the conducted body currents were to be measured only "for an adult of average height and weight". With regard to the arbitrary 100 MHz break point, Dr. Gandhi indicated that SC-4 could not be concerned with such real-world considerations as frequency usage by industry or by application.

Exhibit 8: April 17, 1992 letter advising that Dr. Gandhi's March 18, 1992, letter did not satisfy our concerns about IEEE C95.1-1991, and continuing our objection to adoption of IEEE C95.1-1991 as an American National Standard.

Our April 17 letter was filed prior to the April 20, 1992, deadline specified in the April 6, 1992, IEEE letter, so it was again timely filed. We continued to express our opinion that there was no scientific justification for a 100 MHz cut-off for body current limits. We pointed out that, if left unchanged, IEEE C95.1-1991 would result in the nonsensical situation of having a conducted body current limit for a 3-kilowatt Class A FM station just below 100 MHz, but no limit whatsoever for a 100-kilowatt Class C FM station just above 100 MHz. We questioned how SC-4 could justify ignoring "industry or applications". We also pointed out the vague specification of body current limits in Section 4.1 of the IEEE Standard. Finally, we pointed out the lack of industry consensus for the 100 MHz break point.

Exhibit 9: June 18, 1992, letter from C.S.I. Telecommunications, also objecting to the proposed adoption of IEEE C95.1-1991 as an American National Standard.

We have learned that on June 18, 1992, a second objection to adoption of IEEE C95.1-1991 was sent to ANSI, by the San Francisco consulting firm C.S.I. Telecommunications (EXHIBIT 9A). CSI's objections to IEEE C95.1-1991 included many of the same points raised by us. As documented by the attached January 29, 1993, letter from CSI (EXHIBIT 9B), no response from IEEE concerning their June 18 letter has ever been received. *The CSI objection has simply been ignored.*

Exhibit 10: July 23, 1992, letter from Dr. Gandhi.

Dr. Gandhi's second letter attempting to justify the IEEE C95.1-1991 standard was not received by us until August 17, 1992, due to use of an incorrect zip code in the August 3, 1992, IEEE cover letter routing Dr. Gandhi's July 23 letter to us. Dr. Gandhi addressed, but did not satisfy, each of our objections. He invited Hammett & Edison to participate in the *next* review cycle for the IEEE C95.1-1991 standard, by applying for membership on SC-4. *This is the first invitation Hammett & Edison has received to participate on the SC-4 subcommittee and in the development of an ANSI successor standard.*

Exhibit 11: August 31, 1992, letter to Board of Standards Review.

Our August 31, 1992, letter to the Board of Standards Review (BSR) advised of our continuing objection to the IEEE C95.1-1991 standard and provided, in considerable detail, our reasons for those continued objections. We wish to point out that this response was timely filed; that is, within 15 days of receipt of the August 3, 1992, IEEE letter.

Exhibit 12: October 20, 1992, letter inquiring into reasons for placing IEEE C95.1-1991 balloting "on hold".

Pending resolution of our unresolved objection to IEEE C95.1-1991, we learned from Ms. Somerville that balloting by ANSI concerning adoption of IEEE C95.1-1991 as an

American National Standard had been placed "on hold"; however, Ms. Somerville declined to divulge the reason(s) for this action and directed our query to Dr. Gandhi. We could not understand how ANSI could submit IEEE C95.1-1991 for an adoption vote in the first place, given that there were two unresolved objections pending. Our October 20, 1992, letter to Dr. Gandhi requested information on the reason(s) for placing the balloting on hold; we wanted to know if that action was due to the pending and unresolved objections to IEEE C95.1-1991. *No response to our October 20, 1992, letter was ever received from Dr. Gandhi, or from any other SCC28 or SC-4 member.*

Exhibit 13: Failure of SCC28 Secretary to forward September 5, 1990, H&E letter to SC-4.

As documented by EXHIBIT 13A, Hammett & Edison senior engineer Dane Ericksen, P.E., attended the November 12, 1992, meeting of SC-4 in San Diego, California. During the "other business" portion of the SC-4 agenda, Mr. Ericksen asked the question documented in EXHIBIT 13B: namely, what was the basis for placing balloting regarding ANSI's adoption of IEEE C95.1-1991 "on hold". It was only at that point did we learn that the balloting delay had nothing to do with the unresolved and pending objections of Hammett & Edison and of CSI.

Dr. Gandhi then criticized Mr. Ericksen for not raising his objection to the new standard in a more timely manner. Mr. Ericksen explained that a timely objection *had* been raised, over two years earlier, in the form of our September 5, 1990, letter (EXHIBIT 4). *Dr. Gandhi stated he had no knowledge of that letter.* At the end of the SC-4 meeting, Mr. Ericksen approached Dr. Gandhi and asked if he had understood Dr. Gandhi correctly: that he had never received a copy of the Hammett & Edison September 5, 1990, letter, objecting to the then draft version of IEEE C95.1-1991. Dr. Gandhi confirmed that was correct and explained that the SCC28 Secretary, Mr. John Woods, was in the process of being fired at that time and probably had not been too concerned about seeing that the SCC28 committee work was properly handled.

As shown in EXHIBIT 13C, these shocking facts documenting lack of due process were summarized in our November 17, 1992, letter to SC-4 member Jules Cohen.

Exhibit 14: Ignored request for SC-4 membership.

As a result of Mr. Ericksen's attendance at the November 12 SC-4 meeting in San Diego, a letter dated November 17, 1992, formally requesting membership on SC-4, was jointly sent to Drs. Adair and Gandhi, the two SC-4 Co-Chairs. *No response to that membership request letter has ever been received.*

Exhibit 15: Notification of Approval of Standard.

On November 24, 1992, we received EXHIBIT 15, notifying us that, on November 18, 1992, the BSR adopted IEEE C95.1-1991 as a successor standard to ANSI C95.1-1982, identified as ANSI/IEEE C95.1-1992. That notice indicated that there was a 15-day period for filing an appeal.

Exhibit 16: December 10, 1992, H&E appeal of adoption of IEEE C95.1-1991 as an American National Standard.

On December 10, 1992, Hammett & Edison filed an appeal objecting to adoption of IEEE C95.1-1991 as an American National Standard, on the grounds of lack of due process and lack of industry consensus.

Exhibit 17: December 18, 1992, BSR action suspending adoption of IEEE C95.1-1991 as an American National Standard.

On December 23, 1992, we received word that the BSR had suspended its approval of IEEE C95.1-1991 as an American National Standard, pending an appeal hearing in New York City on February 4, 1993.

LACK OF INDUSTRY CONSENSUS

Exhibit 18: Letters documenting lack of industry consensus for ANSI/IEEE C95.1-1992.

The *Forward* to the ANSI *Operating Procedures* states "lack of adequate consensus indicates that there was opposition to the voluntary adoption and use of the standard from one or more directly and materially affected persons that was sufficient to persuade the BSR that the designation "American National Standard" should not be applied." Exhibits 18A through 18G document a lack of consensus in the broadcasting industry for the ANSI/IEEE C95.1-1992 standard. These letters are from the National Association of Broadcasters (NAB) and from major market radio station group owners. They demonstrate that the objections to IEEE C95.1-1991 filed by Hammett & Edison and by CSI are not lone voices crying in the wilderness.

CANADIAN BODY CURRENT STANDARD

Although the *Forward* to the ANSI *Operating Procedures* states that the BSR only determines if due process has been given and whether a proposed standard represents industry consensus, and "... does not evaluate and judge the technical content of the standard", the IEEE rebuttal nevertheless delves into the merits of a 100 MHz conducted current standard. We therefore feel justified in pointing out that the recently adopted Canadian RFR standard, Safety Code 6 ("SC-6"), only extends its contact current provision to 30 MHz.

SC-6 is a 1991 RFR standard adopted by the Government of Canada. As documented by EXHIBIT 19, its contact current limit extends to only 30 MHz. A 30 MHz contact current limit addresses the shock and burn hazard from *AM broadcast stations and short wave stations*, the problem cited at the bottom of Page 1 to Attachment 1 of the IEEE rebuttal. We certainly agree that a long wire rope, or large metal objects, can induce significant RF currents near high-powered AM or shortwave broadcast stations.

According to Dr. Art Thansandote, Research Scientist for the Health and Welfare Department in Ottawa[1], the current version of SC-6 was written by Dr. Maria Stuchly, who has since left that department for a position with the Department of Electrical and Computer Engineer, Victoria, BC.[2] On December 29, 1992, Hammett & Edison engineer Dane Ericksen reached Dr. Stuchly, to inquire whether she was aware of Dr. Gandhi's 1988 paper "RF Currents Induced in an Anatomically-Based Model of a Human for Plane-Wave Exposures (20-100 MHz)", published in the July 1989 issue of *Health Physics* (Vol. 57, No. 1, pp 89-98) and apparently the major basis for the IEEE SC-4 subcommittee extending its new conducted current standard to 100 MHz, when she drafted the updated Canadian RFR standard. Dr. Stuchly informed Mr. Ericksen that she was aware of Dr. Gandhi's 1988 paper but nevertheless felt that a 30 MHz limit for contact currents was sufficient to ensure the safety of the public and workers. Dr. Stuchly expressed her opinions about the practical difficulties in trying to measure body or contact currents in the VHF range and that, in otherwise SC-6 compliant fields, human body capacitance would limit any induced currents to safe levels.

We also wish to point out that, for workers such as tower riggers, exposures are generally not plane-wave, and any conclusions reached on the assumption of plane-wave conditions would be flawed. We also note the impracticality of attempting to model a 5,000-cell model of a human for the various body positions that a tower rigger could be expected to encounter while performing on-tower work, assuming that the non-plane-wave modeling problem could be overcome.

The FCC has recently begun requiring on-tower exposure calculations in addition to ground-level exposure calculations. While it is possible to model the on-tower predicted power density levels caused by multiple antennas at a multi-user site, we are aware of no practical means to model the resulting induced body currents. Adoption of an induced body current limit applying into the VHF band could effectively preclude any on-tower access at multi-station sites unless all FM and TV stations at the site are shut down. This would be an unreasonable and unnecessary burden.

INSTRUMENTATION

We disagree with the IEEE claim that "commercial meters are available" to measure induced body currents and that such measurements would not be a hardship. We would agree with such a statement if it only applied to AM and shortwave stations. We think that measuring induced body currents at VHF frequencies *is* a difficult undertaking. We are aware of only a single induced body current meter currently on the market, the Holaday Industries Model HI-3701. This is a "bathroom scale" type of meter that requires standing on the meter to measure the induced body current and would be completely impractical for on-tower measurements. Further, our discussions with the

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1 Health and Welfare Department, 775 Brookfield Road, Ottawa, Ontario, Canada K1A 131; telephone 613-954-0306.

2 Department of Electrical and Computer Engineering, Engineering Office Wing, Fourth Floor, 3800 Finnerty Road, Victoria, BC, Canada V8W 3P6; telephone 604-721-6029. Dr. Stuchly is the author of "Proposed Revision of the Canadian Recommendations on Radiofrequency-Exposure Protection", printed in the December 1987 issue of *Health Physics* (Vol. 53, No. 6, pp 649-665).

manufacturer regarding the HI-3701 disclosed that it lacks a sharp cutoff low pass filter, to limit its pickup only to signals below 100 MHz. Therefore, use of this meter at a multi-station site with above-100 MHz FM stations or with VHF high-band television stations could result in excessively high readings.

We further note that the recently revised ANSI C95.3-1991, "IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields– RF and Microwave", states, at Section C3 ("Body Current Measurement"), that

> SAR may be assessed by measuring the RF current flowing in an exposed object. In humans, measurement of the induced currents flowing in the legs to ground have been studied at RF frequencies *below about 50 MHz.* (italics added).

We believe this supports Dr. Stuchly's opinion, which we share, that measurement of conducted body currents in the VHF band would be an onerous compliance burden.

FCC RULEMAKING

The IEEE rebuttal suggests that any problem broadcasters might have with the standard can be fixed in a Federal Communications Commission (FCC) rulemaking. We believe that far better approach is to develop a proper standard in the first place, and to not settle for a standard that even IEEE concedes may need modification to make it acceptable to broadcasters.

Broadcasters are by far the highest powered intentional radiators that will have to "live" with whatever standard is ultimately adopted to succeed ANSI C95.1-1982. Although it is true that the FCC is required to open a rulemaking to decide whether to adopt a successor ANSI RFR standard as the FCC processing standard, it must be realized that the FCC has repeatedly held that it is not the expert agency in the field of biological effects of non-ionizing radio frequency radiation. Therefore the FCC will be under considerable pressure to adopt the successor ANSI RFR standard *in toto.* While it is true that the FCC modified its implementation of the ANSI C95.1-1982 Standard in 1990, in Mass Media Docket 88-469, this was the result of a multi-year undertaking[3] by Hammett & Edison, and involved a *clarification* of ANSI C95.1-1982 rather than an *amendment.* ANSI C95.1-1982 specifies that measurements are to be made *no closer* than 5 cm to objects; Docket 88-469 clarified that measurement of "hot-spots" could be made at no closer than 10 cm to a re-radiating metallic object and that this distance was to be measured from the closest sensing element of the probe used to make the measurement, rather than from the center of the probe.

To compare a clarification of an 8-year old ANSI standard to an outright modification of a just-adopted standard is misleading at best.

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[3] Hammett & Edison, Inc. filed a Request for Declaratory Ruling with the FCC on July 23, 1987. That Request resulted in Mass Media Docket 88-469, "In the Matter of Request for Declaratory Ruling: Section 1.1307(b); Radio Frequency Radiation Compliance". The effective date of the amendment to Section 1.1307(b) of the FCC Rules was April 18, 1990.

SUMMARY

The broadcasting industry represents the highest-powered class of *intentional* RF radiators and its concerns cannot be discounted as a minor issue. Exhibit 18 documents that these are not the objections of just a few stations. The burden of an arbitrary and capricious RFR standard would fall the heaviest on the broadcasting industry. While we agree that four members of the SC-4 subcommittee (Cohen, Justus, Kean, and Hatfield) have broadcast experience, we dispute the IEEE claim that all of those members have not objected to the 100 MHz break point. As documented by EXHIBIT 20, even SC-4 member Jules Cohen expressed his dissatisfaction with the 100 MHz break point. SC-4 member James Hatfield expressed his dissatisfaction with the 100 MHz break point to Mr. Ericksen at the SC-4 November 12, 1992, meeting in San Diego. We further note that the IEEE rebuttal fails to point out that Mr. Justus is no longer with NAB, now serves on SC-3 rather than SC-4, and that NAB is now one of the parties objecting to adoption of IEEE C95.1-1991.

Even more enlightening is the information provided by Mr. Justus regarding the IEEE "Rebuttal of Appeal of ANSI Approval of IEEE C95.1-1991" (Attachment #1 to the January 20, 1993, IEEE letter). As documented by EXHIBIT 21, Mr. Justus explained that at the December 1987 SC-4 meeting in Chicago he *favored* rather than opposed volume averaging, and that it was Dr. Gandhi who proposed substituting induced current limits in lieu of volume averaging. Mr. Justus also stated that he did not even attend the January 1989 SC-4 meeting in Las Vegas, at which the IEEE Attachment #1 claims Mr. Justus gave his approval for current limits up to 100 MHz.

The letters comprising EXHIBIT 18 document that the 100 MHz break point for conducted body currents would not pose only "a small inconvenience".[4] The 100 MHz break point is no more than an artifact of our numbering system. Figure 9 to Dr. Gandhi's previously-cited 1988 paper, with its plane-wave limitation, shows a marked decrease in predicted body currents above 80 MHz. We are appalled that SC-4 feels that justification for *not* selecting a more reasonable break point is because it would require "...unnecessary complexity in the mathematical formulations".[5] Considering the wide availability of programmable calculators and computers, such an excuse borders on the ludicrous.

---

4 IEEE January 20, 1993 response to Hammett & Edison appeal, at Page 10.

5 *Ibid*, at Page 9.

For these reasons, we urge that our appeal be upheld and that IEEE C95.1-1991, in its current form, be denied American National Standard status. We are willing to work with IEEE to correct those aspects of IEEE C95.1-1991 that are *unnecessarily* burdensome to the broadcasting industry, assuming that our request to join SC-4 is granted.

Sincerely,

Dane E. Ericksen

jk

Enclosures: Exhibits 1 through 21

cc: Dr. Eleanor R. Adair, SC-4 (w/ encls.)
Mr. Michael V. Chiarulli, Capital Cities/ABC Inc. (w/ encls.)
Dr. Robert F. Cleveland, Jr., FCC (w/ encls.)
Christopher D. Imlay, Esq., Booth, Freret & Imlay (w/encls.)
Mr. Jules Cohen, Jules Cohen & Associates (w/ encls.)
Mr. Robert Dieterich, *Microwave News* (w/ encls.)
Dr. Om P. Gandhi, SC-4 (w/ encls.)
Mr. Ralph H. Justus, EIA (w/ encls.)
Mr. Charles T. Morgan, Susquehanna Radio Corp. (w/ encls.)
Mr. Michael S. Newman, C.S.I. Telecommunications (w/ encls.)
Mr. Alan W. Parnau, CBS Radio (w/ encls.)
Mr. Michael C. Rau, NAB (w/ encls.)
Mr. Milford K. Smith, Jr., Greater Media, Inc. (w/ encls.)
Mr. Neil M. Smith, Smith & Powstenko (w/ encls.)
Mr. E. Glynn Walden, Group W (w/ encls.)

EXHIBITS 1–21

TO HAMMETT & EDISON APPEAL OF ANSI/IEEE C95.1-1992

February 4, 1993

Hammett & Edison, Inc.
Consulting Engineers
San Francisco

EXHIBIT 1

HAMMETT & EDISON, INC.

CONSULTING ENGINEERS
RADIO AND TELEVISION

ROBERT L. HAMMETT, P.E.
EDWARD EDISON, P.E.
ROBERT P. SMITH
DANE E. ERICKSEN, P.E.
HARRISON J. KLEIN, P.E.
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May 3, 1990

American National Standards Institute
Institute of Electrical & Electronics Engineers
345 East 47th Street
New York, New York 10017

Gentlemen:

We would appreciate receiving a copy of the "Draft of American National Standard C95.1, Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields (300 kHz - 100 GHz)", as described in the article "Selecting RF/Microwave Instrumentation For Compliance Measurements" by J. A. Leonowich, PhD., Battelle Pacific Northwest Laboratories, Richland, Washington. This article appears in the 1990 International Journal of EMC* , at page 221. The article makes repeated references to the ANSI C95.1 draft standard. As a consulting engineering firm extensively involved with radio frequency radiation ("RFR") issues as they pertain to broadcast stations, we are most interested in receiving and examining a copy of the draft standard.

If a fee is involved, please bill us. If prior payment is required, please call me collect and I can either send you such payment or provide a VISA account number to be charged. Thank you.

Sincerely,

Dane E. Ericksen

sp

RLH	WGH	GES	[illegible]	JT
EE	DEE	FS	RSJ	MK
RPS	HK	LF	EM	
File 4E150				

* Published by R&B Enterprises, a division of Robar Industries, Inc. 20 Clipper Road, West Conshohocken, Pennsylvania, 19428-2721, (215) 825-1960

CREDIT CARD ADJUSTMENT NOTICE

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Box 280068
San Francisco CA 94128

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Date: 7-30-90

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___ Non-receipt of Material

xxx Product Returned STD C95.1 SH08631 $15.00 postage $4.00

___ Member discount not applied

xx Other: STD C95.1 draft is not yet available. This std goes to the Board in September. we should receive copies shortly after.

kb/cs

CUSTOMER NO. (3–10)

TRC	ACCOUNT NO. (11–20)	CREDIT AMOUNT (21–27)	PRODUCT NO. (28–34)	QUANTITY (35–40)
9 (1–2)				000000
9 (1–2)				000000
9 (2)				000000
RC (2)				000000
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EXHIBIT 3

HAMMETT & EDISON, INC.

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RADIO AND TELEVISION

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EDWARD EDISON, P.E.
ROBERT P. SMITH
DANE E. ERICKSEN, P.E.
HARRISON J. KLEIN, P.E.
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August 3, 1990

CERTIFIED MAIL, RETURN RECEIPT REQUESTED
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American National Standards Institute
Institute of Electrical & Electronic Engineers, Inc.
P.O. Box 1331
Piscataway, New Jersey 08855-1331

References: Order Number 9005110064
Customer Number 09410879

Gentlemen:

I was very surprised to receive your form letter of July 30, advising that the C95.1P draft standard is not available. You indicated that the draft standard is expected to go to the IEEE/ANSI review board in September, and that copies should become available shortly thereafter.

Hammett & Edison, Inc. has been very active in the field of radio frequency radiation ("RFR") measurements, particularly as they apply to broadcast stations. We provided input to the FCC when it was preparing its OST65 bulletin, and we were responsible for a new categorical exclusion being adopted by the FCC (FCC Docket 88-469, effective April 18, 1990) for stations which do not by themselves exceed 1% of the ANSI C95.1 standard. We have performed RFR surveys or calculations at numerous broadcast sites, such as the Sutro Tower in San Francisco, the San Bruno Mountain antenna farm south of San Francisco, the Mt. Wilson antenna farm near Los Angeles, the Walnut Grove antenna farm near Sacramento, South Mountain Park near Phoenix, Farnsworth Peak near Salt Lake City, and Mt. Soledad in San Diego, to name just a few. We therefore have considerable interest in any changes to the current ANSI C95.1 RFR standard.

Our request for a copy of the draft standard was prompted by an article which appeared in the 1990 International Journal of EMC, at page 221. This article is enclosed for your reference. As you can see, beginning at the middle of page 222 it discusses in some detail the ANSI C95.1 draft standard. Obviously the author, Dr. J. A. Leonowich of Battelle Northwest Laboratories, Richland, WA, has had access to a copy of the draft standard for some time, as we received our copy of the journal over three months ago, on April 30, 1990. We therefore question the propriety of IEEE refusing to release copies to interested parties.

The proposed changes to the ANSI C95.1 standard appear likely to impact significantly field surveys on AM broadcast stations. Field surveys at FM and TV sites may also be significantly affected. We feel IEEE has an obligation to release details of a draft standard to all interested parties if, as is the case here, the standard is sufficiently developed to be the subject of an article in an industry trade journal.

We therefore once again request that we be provided with a copy of the ANSI C95.1D draft standard.

Sincerely,

Dane E. Ericksen

jm

Enclosure

P 137 490 332

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
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(See Reverse)

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EXHIBIT 4

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September 5, 1990

Mr. John J. Woods
Staff Engineer & SCC28 Secretary
IEEE Standards Department
P.O. Box 1331
Piscataway, New Jersey 08855-1331

[illegible]	[illegible]	[illegible]	[illegible]	JT
EE	[illegible]	FS	BSJ	MK
[illegible]	HK	LF	FHJ	

File IEEE C95.1 revisions

Dear Mr. Woods:

Thank you for fulfilling our order for a copy of the "final-final", July 1990, draft of IEEE Standard C95.1-1990, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz". We fully realize the unratified nature of this document, which you indicated was in its ninth revision.

We take some consolation that this draft standard has not yet been ratified, as we feel it has some serious shortcomings. We would be obliged if you would ensure that this letter is circulated among the IEEE Standards Coordinating Committee 28 ("SCC28") committee members. It is our hope that our comments will result in the committee re-thinking what we see as some onerous provisions in the draft standard.

First, some background on Hammett & Edison and our qualifications, as it were, to make comments on the C95.1-1990 draft. Hammett & Edison, Inc., Consulting Engineers, is a professional service corporation that provides consultation to commercial and governmental clients on communications, radio, television, and related engineering projects. Nine engineers comprise the technical staff, which is supported by drafting, secretarial, and accounting personnel. Specialized computer, instrumentation, and laboratory facilities are provided as required by the projects undertaken.

We have been very active in the field of radio frequency radiation ("RFR") measurements, particularly as they apply to broadcast stations. We provided input to the FCC when it was preparing its Office of Science and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation" ("OST65"), and we were responsible for a new categorical exclusion being adopted by the FCC for stations which do not by themselves exceed 1% of the ANSI C95.1-1982 standard (FCC General Docket 88-469, effective April 18, 1990). We have performed RFR surveys or calculations at numerous broadcast sites, such as the Sutro Tower in San Francisco,

the San Bruno Mountain antenna farm south of San Francisco, the Mt. Wilson antenna farm near Los Angeles, the Walnut Grove antenna farm near Sacramento, South Mountain Park antenna farm near Phoenix, Farnsworth Peak near Salt Lake City, Mt. Soledad in San Diego, and the Senior Road antenna farm near Houston, to name just a few.

The president of Hammett & Edison, William F. Hammett, P.E., is co-authoring the chapter on RFR compliance for the upcoming Eighth Edition of the National Association of Broadcasters ("NAB") Engineering Handbook. The other co-authors are Jules Cohen, P.E. and Richard A. Tell, both members of the IEEE SCC28 committee (formally the ANSI C95 Committee). I have appeared on several national RFR workshop panels sponsored by the NAB and by the Society of Broadcast Engineers ("SBE"), and my name appears on page (i) of OST65 ("Acknowledgements"). We therefore have considerable experience in RFR issues and great interest in any changes to the current ANSI C95.1-1982 RFR standard.

Our biggest concern with the IEEE C95.1-1990 draft standard is its adoption of a "body current" limit for conducted radio frequency currents. We feel that measurements of body currents will depend so heavily on human variation that it cannot be a practical criteria in the real world. For example, Section 4.1.1(a)(i) of the draft standard proposes a limit of 100 mA of induced body current through each foot of a freestanding individual. Is this with or without shoes and socks? Dry or sweaty feet? For a 72 inch adult male or a 36-inch toddler? A workable RFR standard should prescribe acceptable limits on the environment and not an infinite number of possible individual responses to that environment. We need to be able to make objective, not subjective, measurements. Ambient fields should tell the whole story for compliance certification purposes.

A second major problem with the draft standard is the 100 MHz break point for changing the exposure limits (i.e., electric and magnetic field limits below 100 MHz and power density limits above 100 MHz). This break point is in the middle of the 88-108 MHz FM Broadcast band. EPA studies have found that FM Broadcast stations are the predominant source of public RFR exposures in the United States. To adopt a standard which uses a fixed 1 mW/cm^2 limit for FM stations above 100 MHz and a rising $10,000/f^2$ mW/cm^2 far-field equivalent limit for FM stations under 100 MHz seems arbitrary and capricious. A 100 MHz break point appears nothing more than an artifact of our numbering system and is not based on any scientific rationale with which we are aware. Adoption of a break point in the middle of the FM Broadcast band will significantly increase the difficulty and cost of RFR field surveys. Narrow-band measurements will be needed to supplement broad-band measurements and site surveys may require two passes: once using an E-field probe, and again using an H-field probe. If the site contains high-powered UHF television stations, use of an H-field probe may give erroneously high readings due to resonances in the magnetic-field probe above the probe's 300 MHz upper frequency limit. We urge that the break point be changed to either 88 MHz or to 108 MHz, so that all stations in the FM Broadcast band are treated uniformly.

Our primary concern with RFR issues is meeting FCC-specified criteria. As you undoubtedly know, the FCC selected the non-government ANSI C95.1-1982 guidelines because they are scientifically based, widely accepted, and applicable to the general population as well as to workers. When the successor to ANSI C95.1-1982 is finally adopted, the FCC will have to open a rule-making proceeding to decide whether to adopt that new guideline. The FCC may well choose another guideline if the new IEEE standard adopts impractical body current criteria which will vary with the size, mass, clothing, and skin conditions of persons subjected to electromagnetic fields, or which treats FM stations below 100 MHz differently from FM stations above 100 MHz.

We urge the IEEE SCC28 Committee to re-consider these aspects of the draft standard.

Sincerely,

Dane E. Ericksen

lr

cc: Mr. Jules Cohen, P.E., Jules Cohen & Associates
Mr. Richard A. Tell, Richard A. Tell & Associates
Dr. Robert F. Cleveland, Jr., FCC
Mr. Ralph A. Justus, National Association of Broadcasters

EXHIBIT 5A

HAMMETT & EDISON, INC.
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RADIO AND TELEVISION

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EDWARD EDISON, P.E.
Consultants to the Firm

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GERHARD J. STRAUB, P.E.
NATHAN HAMILTON
STANLEY SALE

November 1, 1991

Mr. John J. Woods
Staff Engineer & SCC28 Secretary
IEEE Standards Department
P. O. Box 1331
Piscataway, New Jersey 08855-1331

Dear Mr. Woods:

In August 1990 you kindly sent me a copy of IEEE draft standard C95.1, then in its ninth revision, with a caveat about the volatile nature of a draft standard. My September 5, 1990, letter to you expressed our concerns over some of the provisions in the draft standard. As a firm that has had extensive experience with radio frequency radiation (RFR) issues, especially as they apply to broadcast facilities, we are interested in seeing that any successor standard to ANSI C95.1-1982 be practical as well as scientifically valid.

We understand that the Standards Coordinating Committee 28 (SCC28) formally adopted the IEEE C95.1-1991 Standard on September 26, 1991. We would appreciate receiving a copy of this new standard as soon as it becomes available. Any costs involved may be charged to Mastercard No.

Thank you for your consideration. Should you have any questions regarding this request, please do not hesitate to call.

Sincerely yours,

Dane E. Ericksen

mk

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GE-150

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EXHIBIT 5B

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HARRISON J. KLEIN, P.E.
ROBERT P. SMITH
DANE E. ERICKSEN, P.E.
GERALD E. SPILLMAN, P.E.
GERHARD J. STRAUB, P.E.
NATHAN HAMILTON
STANLEY SALEK
JONATHAN C. STILWELL

January 6, 1992

Ms. Susan Validotti
IEEE Service Center
445 Hoes Lane
Piscataway, New Jersey 08855-1331

Re: IEEE Order No. 9112310077

Dear Ms. Validotti:

I am returning the above referenced order for a copy of the IEEE C95.1-1990 draft standard, as I see it is identical to the draft standard we received on August 23, 1990, from Mr. John J. Woods, Staff Engineer & SCC28 Secretary (whom you indicated has since left IEEE).

My November 1 letter had requested a copy of the new IEEE C95.1-1990 standard concerning human exposure to radio frequency energy. My letter was triggered by information that the SCC 28 committee had adopted a final version of this standard on September 26, 1991. We wanted to ensure that we had the latest version in our files.

However, since it is now clear that the order received today is identical to the "Final-Final Draft 1990" copy we received last August, we are returning that duplicate copy in resalable condition (*i.e.*, without any company imprints), and requesting that you process a credit voucher against the credit card account to which this order was charged. For convenience, a copy of the invoice is enclosed, which includes that credit card number.

When the non-draft version becomes available, which you estimated would occur around the end of March 1992, please send us a copy. You should bill that order to the same credit card number. Thank you.

Sincerely,

Dane E. Ericksen

lr

Enclosures (2)

RLH	WBH	GES	GJS	JT
EE	DE	FS	RSJ	MK
EFS	HK	HF	SM	

File GEISO - IEEE C95.1-1990 recover

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